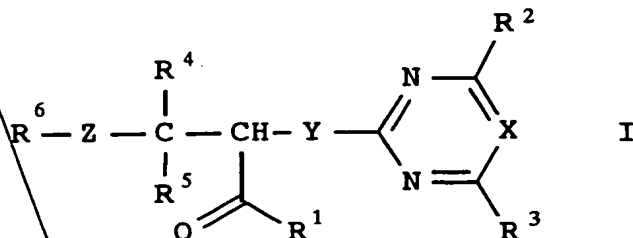


We claim:-

1. A 3-(het)arylcarboxylic acid derivative of the formula I

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where R is formyl, CO₂H or a radical hydrolyzable to COOH and

R² is halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy or C₁-C₄-alkylthio;

X is nitrogen or CR¹⁴, where R¹⁴ is hydrogen or, together with R³, forms a 3-membered or 4-membered alkylene or alkenylene chain, in each of which a methylene group is replaced by oxygen;

R³ is halogen, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy or C₁-C₄-alkylthio or R³ is linked to R¹⁴ as stated above to form a 5-membered or 6-membered ring;

R⁴ is phenyl or naphthyl which may be substituted by one or more, in particular one to three, of the following radicals: halogen, nitro, cyano, hydroxyl, mercapto, amino, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy, C₁-C₄-alkylthio, C₁-C₄-alkylamino, di-C₁-C₄-alkylamino, C₁-C₄-alkylcarbonyl or C₁-C₄-alkoxycarbonyl;

a five-membered or six-membered heteroaromatic structure which contains one to three nitrogen atoms and/or one sulfur or oxygen atom and may carry one or more of the following radicals: halogen, nitro, cyano, hydroxyl, mercapto, amino, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy, C₁-C₄-alkylthio, C₁-C₄-alkylamino, C₁-C₄-dialkylamino, C₁-C₄-alkylcarbonyl, C₁-C₄-alkoxycarbonyl or phenyl;

37

R⁵ is hydrogen, C₁-C₄-alkyl, C₃-C₆-alkenyl, C₃-C₆-alkynyl, C₃-C₈-cycloalkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxyalkyl, C₁-C₄-alkylthioalkyl or phenyl;

5 R⁶ is C₁-C₈-alkyl, C₃-C₆-alkenyl, C₃-C₆-alkynyl or C₃-C₈-cycloalkyl, it being possible for these radicals to be mono- or polysubstituted in each case by: halogen, nitro, cyano, C₁-C₄-alkoxy, C₃-C₆-alkenyloxy, C₃-C₆-alkynyloxy, C₁-C₄-alkylthio, C₁-C₄-haloalkoxy, 10 C₁-C₄-alkylcarbonyl, C₁-C₄-alkoxycarbonyl, C₁-C₄-alkyl-amino, di-C₁-C₄-alkylamino, phenyl or phenyl or phenoxy which is mono- or polysubstituted, for example mono- to trisubstituted, by halogen, nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy or 15 C₁-C₄-alkylthio;

Y is sulfur or oxygen or a single bond; and

Z is sulfur or oxygen;

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with the proviso that R⁶ is not unsubstituted C₁-C₄-alkyl when R⁴ is unsubstituted phenyl, Z is oxygen and simultaneously R⁵ is methyl or hydrogen.

25 2. A 3-(het)arylcarboxylic acid derivative of the general formula I as claimed in claim 1, where R is

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where R¹ has the following meanings:

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a) hydrogen;

b) a succinylimidoxy group;

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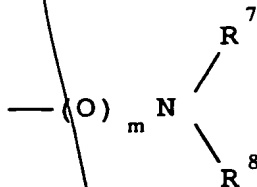
c) a 5-membered heteroaromatic structure which is bonded via a nitrogen atom, contains two or three nitrogen atoms and may carry one or two halogen atoms or one or two of the following radicals:

45

C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy or C₁-C₄-alkylthio;

d) a radical

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where m is 0 or 1 and R⁷ and R⁸, which may be identical or different, have the following meanings:

hydrogen;

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C₁-C₈-alkyl, C₃-C₆-alkenyl, C₃-C₆-alkynyl or C₃-C₈-cycloalkyl, where each of these radicals may carry one to five halogen atoms or one or two of the following groups:

20

C₁-C₄-alkoxy, C₃-C₆-alkenyloxy, C₃-C₆-alkynyloxy, C₁-C₄-alkylthio, C₃-C₆-alkenylthio, C₃-C₆-alkynylthio, C₁-C₄-haloalkoxy, C₁-C₄-alkylcarbonyl, C₃-C₆-alkenylcarbonyl, C₃-C₆-alkynylcarbonyl, C₁-C₄-alkoxycarbonyl, C₃-C₆-alkenyloxycarbonyl, C₃-C₆-alkynyloxycarbonyl, di-C₁-C₄-alkylamino, C₃-C₈-cycloalkyl, phenyl or phenyl which is monosubstituted or polysubstituted by halogen, nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy or C₁-C₄-alkylthio;

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phenyl which may be substituted by one or more of the following radicals: halogen, nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy or C₁-C₄-alkylthio;

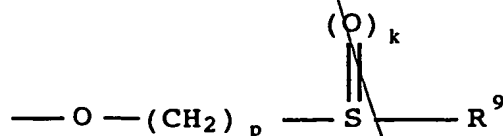
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R⁷ and R⁸ together form a cyclic, optionally substituted C₄-C₇-alkylene chain or together form a cyclic, optionally substituted C₃-C₆-alkylene chain containing a heteroatom selected from the group consisting of oxygen, sulfur and nitrogen;

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e) R¹ is furthermore a group

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where R⁹ is C₁-C₄-alkyl, phenyl or phenyl which is monosubstituted or polysubstituted by halogen, nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-halo-

alkoxy or C₁-C₄-alkylthio, or C₁-C₄-haloalkyl, C₃-C₆-alkenyl or C₃-C₆-alkynyl, p may be 1, 2, 3 or 4 and k may be 0, 1 or 2.

5 f) a radical OR¹⁰, where R¹⁰ is:

i) hydrogen, an alkali metal cation, one equivalent of an alkaline earth metal cation, the ammonium cation or an organic ammonium ion;

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ii) C₃-C₈-cycloalkyl which may carry one to three C₁-C₄-alkyl radicals;

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iii) C₁-C₈-alkyl which may carry one to five halogen atoms or one of the following radicals:

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C₁-C₄-alkoxy, C₁-C₄-alkylthio, cyano, C₁-C₄-alkyl-carbonyl, C₃-C₈-cycloalkyl, C₁-C₄-alkoxycarbonyl, phenyl, phenoxy or phenylcarbonyl, where the aromatic radicals in turn may each carry one to five halogen atoms or one to three of the following radicals: nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-halo alkoxy [sic] or C₁-C₄-alkylthio;

25

iv) C₁-C₈-alkyl which may carry one to five halogen atoms and carries one of the following radicals: a 5-membered heteroaromatic structure containing one to three nitrogen atoms or a 5-membered heteroaromatic structure containing one nitrogen atom and one oxygen or sulfur atom, which may carry one to four halogen atoms or one or two of the following radicals: nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy or C₁-C₄-alkylthio;

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v) C₂-C₆-alkyl which carries one of the following radicals in the 2 position: C₁-C₄-alkoxyimino, C₃-C₆-alkenyloxyimino, C₃-C₆-haloalkenyloxyimino or benzyloxyimino;

40

vi) C₃-C₆-alkenyl or C₃-C₆-alkynyl, where these groups in turn may carry one to five halogen atoms;

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vii) phenyl which may carry one to five halogen atoms or one to three of the following radicals: nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy or C₁-C₄-alkylthio;

viii) a 5-membered heteroaromatic structure which has bonded via a nitrogen atom, contains one to three nitrogen atoms and may carry one or two halogen atoms or one or two of the following radicals: nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy or C₁-C₄-alkylthio;

ix) R¹⁰ is furthermore a group $\text{---N}=\text{C}\begin{matrix} \text{R}^{11} \\ \text{R}^{12} \end{matrix}$ where

R¹¹ and R¹², may be identical or different and are each:

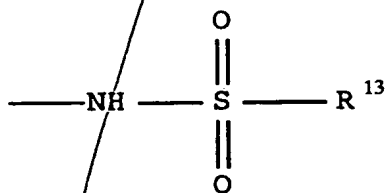
C₁-C₈-alkyl, C₃-C₆-alkenyl, C₃-C₆-alkynyl or C₃-C₈-cycloalkyl, where these radicals may carry one C₁-C₄-alkoxy or C₁-C₄-alkylthio or one phenyl radical;

phenyl which may be substituted by one or more of the following radicals:

halogen, nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy or C₁-C₄-alkylthio;

or R¹¹ and R¹² together form a C₃-C₁₂-alkylene chain which may carry one to three C₁-C₄-alkyl groups;

g) or R¹ forms a radical



where R¹³ is:

C₁-C₄-alkyl, C₃-C₆-alkenyl, C₃-C₆-alkynyl or C₃-C₈-cycloalkyl, where these radicals may carry one C₁-C₄-alkoxy or C₁-C₄-alkylthio or one phenyl radical;

phenyl which may be substituted by one to five halogen atoms or one to three of the following radicals: nitro, cyano, C₁-C₄-alkyl, C₁-C₄-haloalkyl, C₁-C₄-alkoxy, C₁-C₄-haloalkoxy or C₁-C₄-alkylthio.

- 5 3. A 3-arylcarboxylic acid derivative of the formula I as claimed in claim 1, in which R⁴ is phenyl which may be substituted as stated in claim 1 and the remaining substituents have the meanings stated in claim 1.
- 10 4. A 3-arylcarboxylic acid derivative of the formula I as claimed in claim 1, in which Z is oxygen, R⁴ is phenyl which may be substituted as stated in claim 1, R⁵ is methyl, X is CH, R² and R³ are each methoxy and Y, R¹ and R⁶ have the meanings stated in claim 1.
- 15 5. A 3-hetarylcarboxylic acid derivative of the formula I as claimed in claim 1, in which R⁴ is a five- or six-membered heteroaromatic structure as claimed in claim 1 and the remaining substituents have the meanings stated in claim 1.
- 20 6. A 3-hetarylcarboxylic acid derivative of the formula I as claimed in claim 1, in which Z is oxygen, R⁴ is a five- or six-membered heteroaromatic structure as claimed in claim 1, R⁵ is methyl, X is CH, R² and R³ are methoxy and Y, R¹ and R⁶ have the meanings stated in claim 1.
- 25 7. A herbicide containing a compound of the formula I as claimed in claim 1 and conventional inert additives.
- 30 8. A method for controlling undesirable plant growth, wherein a herbicidal amount of a compound of the formula I as claimed in claim 1 is allowed to act on the plants or on their habitat.
- 35 9. An agent for influencing plant growth, containing a compound of the formula I as claimed in claim 1 and conventional inert additives.

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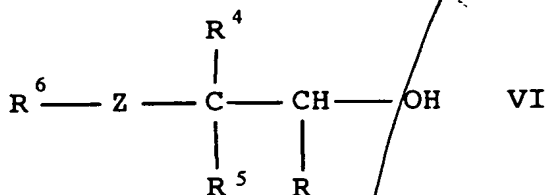
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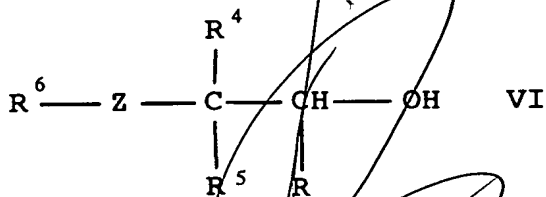
40 10. A method for regulating plant growth, wherein a bioregulatory amount of a compound of the formula I as claimed in claim 1 is allowed to act on the plants or on their habitat.

45 11. A 3-(het)arylcarboxylic acid derivative of the formula VI

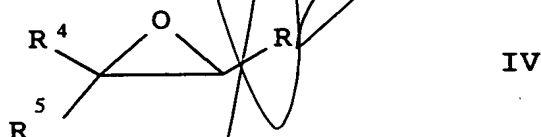
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where R, R⁴, R⁵, R⁶ and Z have the meanings stated in claim 1, with the proviso that R⁶ is not unsubstituted alkyl when R⁴ is unsubstituted phenyl or 4-isobutylphenyl, Z is oxygen and R⁵ is simultaneously methyl or hydrogen.

12. A process for the preparation of a 3-(het)arylcarboxylic acid derivative of the formula VI



wherein an epoxide of the formula IV

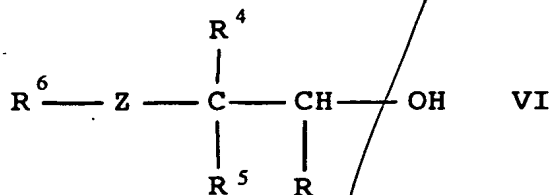


where R, R⁴ and R⁵ have the meanings stated in claim 1, is reacted with a compound of the formula V



where R⁶ and Z have the meanings stated in claim 1, with the proviso that R⁶ is not unsubstituted alkyl when R⁴ is unsubstituted phenyl or 4-isobutylphenyl, Z is oxygen and R⁵ is simultaneously methyl or hydrogen, if required in an inert solvent or with the addition of a suitable catalyst.

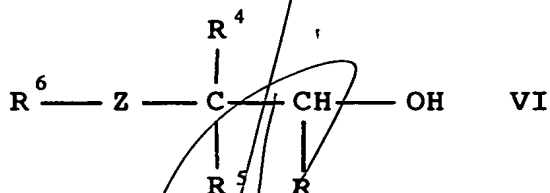
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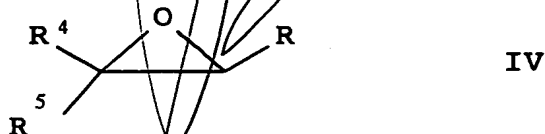
where R, R⁴, R⁵, R⁶ and Z have the meanings stated in claim 1.

- 10 12. A process for the preparation of a 3-(het)arylcarboxylic acid derivative of the formula VI



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- 20 wherein an epoxide of the formula IV



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where R, R⁴ and R⁵ have the meanings stated in claim 1, is reacted with a compound of the formula V

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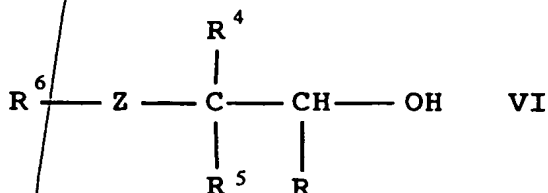


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where R⁶ and Z have the meanings stated in claim 1, if required in an inert solvent or with the addition of a suitable catalyst.

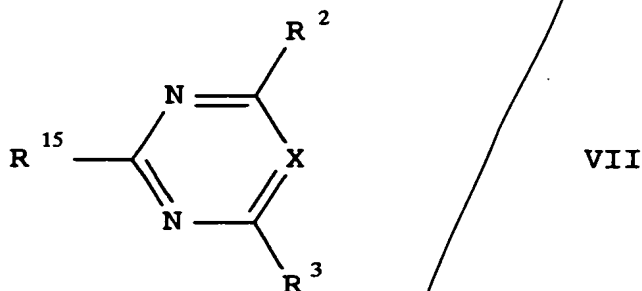
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13. A process for the preparation of 3-(het)arylcarboxylic acid derivatives of the formula I as claimed in claim 1, where Y is oxygen wherein the 3-het(aryl)carboxylic acid derivative of the formula VI



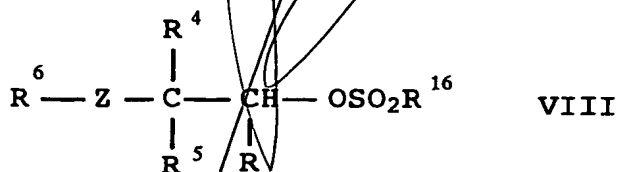
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where the substituents have the meanings stated in claim 1,
is reacted with a pyrimidyl or triazinyl derivative of the
formula VII

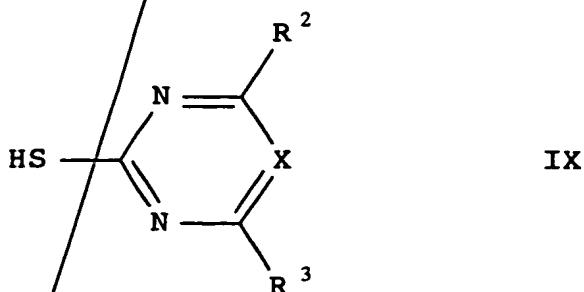


15 where R^{15} is halogen or $R^{16}SO_2-$ and R^{16} is C_1-C_4 -alkyl,
 C_1-C_4 -haloalkyl or phenyl, in an inert solvent in the presence
of a base.

14. A process for the preparation of a 3-het(aryl)carboxylic acid
20 derivative of the formula I as claimed in claim 1, where Y is
sulfur, wherein a 3-het(aryl)carboxylic acid derivative of
the formula VIII



30 where the substituents have the meanings stated in claim 1,
is reacted with a pyrimidyl- or triazinylthiol of the formula
IX



45 where R^2 , R^3 and X have the meanings stated in claim 1.

3-(Het)arylcarboxylic acid derivatives, their preparation and intermediates for their preparation

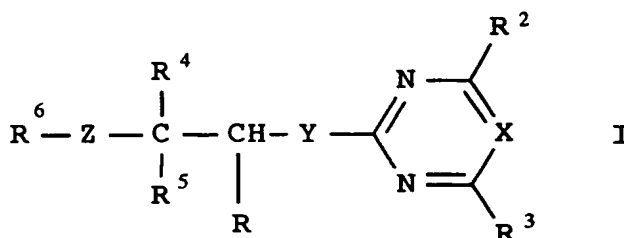
5 Abstract

3-(Het)arylcarboxylic acid derivatives of the formula I

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TLOX

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where R is formyl, CO₂H or a radical hydrolyzable to COOH and the other substituents have the following meanings:

20 R² and R³ are each halogen, alkyl, haloalkyl, alkoxy, haloalkoxy or alkylthio;

X is nitrogen or CR¹⁴, where R¹⁴ is hydrogen or, together with R³, forms an alkylene or alkenylene chain, in each of which a methylene group is replaced by oxygen;

R⁴ is phenyl or naphthyl, each of which is unsubstituted or substituted or an unsubstituted or substituted five-membered or six-membered heteroaromatic structure containing one to three nitrogen atoms or one sulfur or oxygen atom;

R⁵ is hydrogen, alkyl, alkenyl, alkynyl, cycloalkyl, haloalkyl, alkoxyalkyl, alkylthioalkyl or phenyl;

35 R⁶ is C₁-C₈-alkyl, C₃-C₆-alkenyl, C₃-C₆-alkynyl or C₃-C₈-cycloalkyl, each of which may be mono- or polysubstituted;

Y is sulfur, oxygen or a single bond; and

40 Z is sulfur or oxygen;

with the proviso that R⁶ is not unsubstituted C₁-C₄-alkyl when R⁴ is unsubstituted phenyl, Z is oxygen and simultaneously R⁵ is methyl or hydrogen.

45